

Conley E. Ward [ISB No. 1683]
GIVENS PURSLEY LLP
601 W. Bannock Street
P.O. Box 2720
Boise, ID 83701-2720
Telephone: (208) 388-1200
Fax: (208) 388-1300
cew@givenspursley.com

Attorneys for U.S. Geothermal, Inc.
S:\CLIENTS\66672\Kitz Testimony.doc

RECEIVED
FILED
2004 JUN -9 PM 3:44
IDAHO PUBLIC
UTILITIES COMMISSION

BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

U.S. GEOTHERMAL, INC., an Idaho
corporation,

Complainant,

vs.

IDAHO POWER COMPANY, an Idaho
corporation,

Respondent.

Case No. IPC-E-04-08

BOB LEWANDOWSKI and MARK
SCHROEDER,

Complainants,

vs.

IDAHO POWER COMPANY, an Idaho
corporation,

Respondent.

Case No. IPC-E-04-10

**DIRECT TESTIMONY OF KEVIN KITZ
ON BEHALF OF U.S. GEOTHERMAL, INC.**

June 9, 2004

ORIGINAL

1 **A. IDENTIFICATION AND QUALIFICATIONS**

2 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3 A. My name is Kevin Kitz and my business address is 1509 Tyrell Lane, Suite B, Boise, Idaho
4 83706.

5 Q. WHAT IS YOUR OCCUPATION AND BY WHOM ARE YOU EMPLOYED?

6 A. I am the Vice-President of Project Development for U.S. Geothermal, Inc. I have held the
7 position of VP of Project Development with U.S. Geothermal since May of 2003. My
8 responsibilities and objectives include securing a power sales agreement ("PSA") and
9 transmission access, field testing, and other activities. I have participated in the drafting of
10 the Firm Energy Sales Agreements that have been exchanged with Idaho Power Company.

11 Q. PLEASE PROVIDE YOUR BACKGROUND AND EXPERIENCE.

12 A. I am a licensed Professional Mechanical Engineer in the state of California, and have
13 almost nineteen years of experience in the geothermal power industry. I have worked in a
14 variety of positions within the industry, including power plant design and construction,
15 resource development design and construction, resources planning, transmission issues,
16 contracts, operations, and maintenance. My resume is attached as Exhibit No. 2.

17 Q. MR. KITZ, WHAT IS THE PURPOSE OF YOUR TESTIMONY, AND HOW IS IT
18 ORGANIZED?

19 A. My testimony will provide:

- 20 1. A history of the Raft River Geothermal Project;
- 21 2. An explanation of why the proposed monthly generation is that of a 10 megawatts
22 geothermal power plant, and should be entitled to the published rates under the Idaho
23 Commission's PURPA guidelines pertaining to facilities of 10 megawatts or less,

1 including:

- 2 a. an examination of the definition of 10 megawatts, and
- 3 b. the method by which the monthly output of the 10 megawatts power plant was
- 4 calculated;
- 5 3. A discussion of contract terms related to the 10 megawatts size;
- 6 4. An analysis of Idaho Power's proposed performance penalties; and
- 7 5. Recommendations for actions to be taken by the Idaho PUC.

8 **B. OVERVIEW OF THE RAFT RIVER GEOTHERMAL PROJECT**

9 Q. PLEASE EXPLAIN THE HISTORICAL DEVELOPMENT OF THE RAFT RIVER

10 GEOTHERMAL RESOURCE.

11 A. The geothermal resource at the Raft River site, located in southern Cassia County, was first

12 identified before 1950 at two shallow agricultural wells that produced boiling water. In

13 1971, the Raft River Rural Electric Cooperative began preliminary investigations into the

14 possibility of generating electric power from this resource. Reconnaissance geochemical

15 and geological work in 1972 by the U.S. Geological Survey indicated a resource

16 temperature of about 300°F. Supported by the U.S. Energy Research and Development

17 Administration ("ERDA"), the predecessor to the U.S. Department of Energy ("DOE"),

18 investigations focused on using binary cycle technology (which was experimental at that

19 time) to generate electric power. In late 1973, the U.S. Geological Survey ("GSA") began

20 an integrated geological, geophysical, geochemical and hydrological analysis of the Raft

21 River geothermal resource. Early drilling activities at Raft River included 34 auger holes of

22 100 foot depth and five core holes ranging in depth from 250 to 1,423 feet. The next phase

1 of drilling consisted of seven deep, full diameter wells that were completed during 1975 to
2 1978, and subjected to extensive testing.

3 Based on the drilling results, a 5 MW net (7MW gross) demonstration binary power
4 plant was constructed during 1979 to 1981. The plant was operated from September to
5 November 1981. Repairs and modifications were made, and the plant operated again from
6 March through June 1982. The output of the plant was about 4 MW net, and the project
7 confirmed the technical feasibility of binary plant operation with a geothermal fluid source.
8 After an expenditure of over \$40 million dollars, the entire Raft River project was officially
9 shut down at the end of September 1982. ERDA clearly demonstrated that a binary power
10 plant was technically viable, and since then, binary power plants have been successfully
11 built and operated around the world.

12 Due to the cessation of funding for the project, the GSA sold the Raft River property
13 and assets to HYDRA-CO Enterprises, Inc. (a wholly owned subsidiary of Niagara Mohawk
14 Power Company of New York) in March 1984. HYDRA-CO relocated the Raft River
15 power plant to another geothermal field in Nevada where there was an immediate market
16 for electricity sales and kept the Raft River property on a care and maintenance basis. In
17 October 1993, HYDRA-CO sold the project to Vulcan Power Company of Bend, Oregon.

18 Q. WHEN DID U.S. GEOTHERMAL ACQUIRE THE RIGHTS TO DEVELOP THE RAFT
19 RIVER RESOURCE?

20 A. U. S. Geothermal Inc. ("USGEO") was formed as a private Idaho corporation on February
21 28, 2002 for the express purpose of acquiring the Raft River geothermal project and
22 developing the geothermal resource to produce electric power. On March 28, 2002,
23 USGEO entered into an agreement with Vulcan Power Company to purchase 100% of Raft

1 River. Since then, USGEO merged with a Delaware corporation and is now a public
2 company with an active listing in Canada and is currently seeking registration and a listing
3 on the NASD stock exchange.

4 As part of our due diligence on the Raft River project, GeothermEx, Inc., a world
5 recognized geothermal consulting engineering firm was retained to review the data from the
6 ERDA programs and render its opinion of the production potential at Raft River. In
7 August 2002, GeothermEx produced a "Technical Report on the Raft River Geothermal
8 Resource, Cassia County, Idaho" in which it estimated the potential production from the
9 existing well field at 14-17 MW net.

10 Q. WHAT HAS U. S. GEOTHERMAL INVESTED IN THE RAFT RIVER GEOTHERMAL
11 PROJECT THUS FAR?

12 A. USGEO has made a significant investment for the acquisition, engineering, legal and G&A
13 costs associated with advancing the Raft River geothermal project toward the signing of a
14 power purchase agreement. As of April 30, 2004, we have spent \$795,843 directly on the
15 project, and, currently have in progress an approximate \$700,000 well test program to work
16 over and flow test the existing wells at Raft River. The well test program is being
17 accomplished as part of a DOE Geothermal Resource Exploration and Development cost
18 share grant. In addition to these costs, we have spent an additional approximately \$800,000
19 on legal, corporate, accounting, financial, engineering, marketing and other related costs
20 necessary to organize a public company for the purpose of developing the project.

21 Q. PLEASE DESCRIBE THE INFRASTRUCTURE IN PLACE AT RAFT RIVER.

22 A. The infrastructure on the site includes five production size geothermal wells, two injection
23 wells, wellheads, lined drilling sumps, seven groundwater monitoring wells, roads, security

1 fencing, an office/control building, a shop building with a 15 ton overhead crane, a 300,000
2 gallon water tank, and a warehouse. Road access and line power is installed at all seven
3 deep well sites. USGEO owns 560 acres of land and has an additional 3,179 acres of
4 leased geothermal rights surrounding the property.

5 The Raft River Rural Electric Cooperative owns a 138 kV transmission line with a
6 capacity of 120 MW that runs along the northern boundary of the property. The Bonneville
7 Power Administration leases the capacity on the transmission line from the Co-op and has
8 an estimated 60 MW of excess transmission capacity available. USGEO has an
9 interconnect study underway with the Bonneville Power Administration and has submitted a
10 point-to-point transmission request for 30 MW of capacity between the Raft River site and
11 the Minidoka Dam substation.

12 Q. PLEASE DESCRIBE THE RAFT RIVER GEOTHERMAL POWER PLANT.

13 A. The planned Raft River Geothermal Power Plant ("RRGPP") uses geothermally heated
14 water to vaporize an organic working fluid. These types of plants are generally referred to
15 as organic rankine cycle plants, or simply "binary power plants." Hot geothermal water is
16 extracted from the earth and supplied to the RRGPP by a number of wells using downhole
17 line shaft and submersible pumps. Once the geothermal water has had the necessary heat
18 extracted for the binary cycle use and the water has been cooled, it is injected back into the
19 geothermal reservoir. At the RRGPP, the combined production and injection pump load
20 (the "parasitic load") may be as much as 2.5 MW. The geothermal hot water passes through
21 heat exchangers, where it vaporizes the organic working fluid. The working fluid vapor is
22 injected into and turns the turbine to generate electricity and is then condensed. The
23 condenser technology uses air-cooling mechanical devices. The condensed organic

1 working fluid is picked up from the condenser by the boiler feed pumps and delivered back
2 to the vaporizer in a closed circuit.

3 Q. IS THE PLANT EXPERIMENTAL OR USING UNTESTED TECHNOLOGY?

4 A. Absolutely not. There are hundreds of megawatts of geothermal binary power plants
5 installed in the US and worldwide of the same or similar technology as will be installed at
6 Raft River. Binary power plants were commercialized in the mid 1980's and now have
7 roughly twenty years of solid performance.

8 **C. DEFINITION OF WHAT "10 MEGAWATTS" MEANS**

9 Q. IT HAS BEEN STATED THAT THE RAFT RIVER FACILITY WILL HAVE A
10 CAPACITY RATING IN EXCESS OF TEN MEGAWATTS. WHY IS THIS THE CASE
11 IF YOU ARE ONLY SEEKING A TEN MEGAWATT CONTRACT WITH IDAHO
12 POWER?

13 A. There are two main reasons:

14 (1) First, any 10 megawatt thermal power plant, including geothermal power plants, must
15 produce more than 10 megawatts, in order to deliver 10 megawatts.

16 (2) We are seeking a Power Sales Agreement limited to a maximum average annual
17 delivery of 10 megawatts to Idaho Power. This may actually be the total initial capacity of
18 the RRGPP. However, our intention is to build-out the power plant to greater than 10
19 megawatts, either initially or over time. While we would prefer to have a single contract for
20 more than 10 megawatts, economics do not allow new geothermal capacity to be built at the
21 "Surplus Energy" rate that Idaho Power offers for deliveries greater than the 10 megawatts,
22 even if such deliveries are firm. This leaves U.S. Geothermal no choice but to seek
23 additional power sales contracts with entities other than Idaho Power for sales in excess of

1 10 megawatts. If we are ultimately able to generate more than 10 megawatts, then we will
2 deliver 10 megawatts to Idaho Power, and the rest to the other off-takers.

3 Q. WILL THE RAFT RIVER GEOTHERMAL POWER PLANT GENERATOR HAVE A 10
4 MEGAWATT NAMEPLATE?

5 A. The generator nameplate (or sum of the nameplate ratings) will be larger than 10
6 megawatts, even if it is only built as a 10 megawatt power plant. The generator must be
7 capable of supplying the summation of the following loads, thereby determining the actual
8 generator nameplate rating:

- 9 • Contracted Load
- 10 • Capacity for increased generation in cold winter months
- 11 • Transformation Losses
- 12 • Boiler feed pumps
- 13 • Air condenser cooling fans
- 14 • Other power plant loads
- 15 • Production well pumps
- 16 • Injection pumps

17 In the case of the Raft River Geothermal Power Plant, during the extreme heat of the
18 summer months, the generator nameplate could be as much as 17 MW, in order to supply
19 10 megawatts of annual average power to Idaho Power at the Minidoka substation.

20 Q. ARE THE LOADS DESCRIBED ABOVE CONSTANT ONCE THE PLANT IS BUILT?

21 A. The actual auxiliary load of the power plant is a function of several factors that are either
22 unknown at this time, vary over the course of the year, or can even change over several
23 years. Some of the factors, and the loads they affect are listed below.

Factor	Affects these loads
Flowing well temperatures	All auxiliary loads
Depth and number of production pumps	Production pump load
Ease of injection of spent fluid	Injection pump load
Air temperature	All auxiliary loads

1 Q. IS THE GENERATOR NAMEPLATE A RELEVANT MEASURE OF THE
2 CAPABILITY OF THE POWER PLANT TO DELIVER THE CONTRACTED OUTPUT
3 TO IDAHO POWER?

4 A. The generator nameplate is not relevant to the contracted amount, and should not be used to
5 determine the size of the Idaho PURPA qualifying facility. My understanding is that the
6 Commission Staff has agreed with this position in prior cases.

7 Q. IS THE POWER PLANT NAMEPLATE A RELEVANT MEASURE OF THE
8 CAPABILITY OF THE POWER PLANT TO DELIVER THE CONTRACTED OUTPUT
9 TO IDAHO POWER?

10 A. There is no actual physical power plant "nameplate," only a power plant design "rating".
11 The rating is the power plant output established at a very specific set of environmental
12 conditions, including temperature, elevation, relative humidity, etc. However, those design
13 conditions are actually met only a very small percentage of the time. The rest of the time,
14 the output of the power plant is higher or lower, depending on the particular environmental
15 conditions at the time. The standard design point for the geothermal industry (and that
16 used in the preliminary design of the RRGPP) is to use the annual average temperature of
17 the site to arrive at the annual average power output of the plant.

18 Q. IS THIS TRUE OF ALL POWER PLANTS?

19 A. For all thermal plants (e.g. gas turbine, coal-fired, biomass, or geothermal) it is true. The
20 effect is greater or less depending on the design of the power plant, and the type of fuel

1 being used. Typically, thermal power plants are rated at a moderate temperature and
2 relative humidity, rather than at the extreme of either the summer high or the winter low.
3 However, regardless of the design point conditions, the electricity output goes up in the
4 winter as the temperature falls, and the electricity output decreases as summer temperatures
5 go up.

6 On the other hand, wind and hydro units tend to be rated at their maximum capacities.
7 For example a 30 MW wind project will produce the rated capacity at those times that the
8 wind is above a certain speed necessary to turn the windmills.

9 Q. CAN YOU DESCRIBE THE EFFECT OF TEMPERATURE ON THE "SURROGATE
10 AVOIDED RESOURCE" ("SAR")?

11 A. The Idaho "surrogate avoided resource" ("SAR") is a nominal approximately 270 MW gas-
12 fired combined cycle generating plant operating at an international Standards Organization
13 ("ISO") rating temperature (58°F), at an elevation of about 2,000 feet. The SAR is
14 assumed to produce the rated output at all hours of the year. This is physically impossible,
15 but if the assumed standard operating temperature is a reasonable approximation of the
16 annual average temperature, then the annual average output will be approximately the same
17 as the rated capacity of the plant.

18 But the fact is that the Idaho SAR would vary considerably over the course of the
19 year as the temperature changes. The SAR would be unable to produce 270 MW any time
20 the gas turbine inlet temperature is above the design point temperature. Although the Idaho
21 SAR is presumed to have a wet cooling system, many combined cycle plants are now being
22 built with air cooling because of the unavailability of cooling water. Air-cooled power
23 plants are much more sensitive to summer temperatures than water-cooled power plants

1 because the cooling temperature is the drybulb temperature of the air, rather than the
2 wetbulb temperature. The difference between wetbulb and drybulb temperatures can be
3 25-35°F in Idaho in the summer. Thus, summer derating of an air-cooled Idaho plant
4 would be significant.

5 Q. WHEN THE RATING OF A THERMAL POWER PLANT IS DISCUSSED, IS IT
6 GENERALLY UNDERSTOOD TO BE THE MAXIMUM OUTPUT OF THE POWER
7 PLANT?

8 A. Because "rating" is not a rigorously defined term, it could theoretically mean the maximum
9 output of the plant (which would occur in the dead of winter). But generally the "rating" of
10 the power plant would more likely be closer to the average annual output, or at some
11 temperature somewhat higher than the annual average temperature.

12 Q. MR. KITZ, IN YOUR OPINION, IF A GROUP OF POWER PLANT ENGINEERS
13 WERE ASKED WHAT THE OUTPUT FROM A "10 MW THERMAL PLANT"
14 WOULD BE, WHAT WOULD THEY SAY?

15 A. It is safe to say that very few, if any, would expect that "10 megawatts" would define the
16 maximum output of the plant. Almost certainly, most power professionals would expect
17 that a 10 megawatt thermal plant would produce more than 10 megawatts for part of the
18 year, and less than 10 megawatts for part of the year. Most professionals would agree that
19 the 10 megawatts would be produced over the course of the entire year, giving effect for
20 the summer and winter temperature differences.

21 Q. THE PUC RULED THAT PURPA CONTRACTS ENTITLED TO PUBLISHED RATES
22 WERE TO BE 10 MW OR LESS FOR A MAXIMUM OF 20 YEARS. AS AN
23 ENGINEER, DO YOU FIND IDAHO POWER'S ASSERTION THAT THIS MEANS

1 THAT A THERMAL POWER PLANT CAN NEVER PRODUCE MORE THAN 10 MW
2 IN ANY ONE HOUR TO QUALIFY FOR PURPA RATES REASONABLE?

3 A. No. Given the fact that the Commission used a SAR to develop the published avoided cost
4 rates, it is more reasonable to conclude that the Commission expected, and was willing to
5 see, those rates offered to a nominal 10 megawatt power plant. A nominal 10 megawatt
6 power plant would average 10 megawatts over the year, but would produce less than that in
7 the summer and more than that in the winter. This is exactly equivalent to the output
8 variation that forms the basis of the Idaho SAR.

9 Q. WHAT WOULD BE THE CONSEQUENCE OF LIMITING THE IDAHO SAR TO A
10 MAXIMUM OUTPUT OF ITS RATED OUTPUT?

11 A. The higher winter generation from the SAR helps decrease the annual average cost of
12 power from the SAR. Without a doubt, limiting the SAR to it's rated output would raise
13 the cost of power from the SAR.

14 Q. WHAT WOULD BE THE CONSEQUENCE OF DEFINING A 10 MEGAWATT PURPA
15 POWER PLANT AS LIMITED TO THE ABILITY TO PRODUCE NO MORE THAN 10
16 MEGAWATTS IN ANY HOUR?

17 A. That definition would effectively limit *any* thermal power plants to a rating of about 8.5
18 MW, or less. This would allow the operator to make full use of the investment in
19 equipment and produce 10.0 megawatts in the winter, and less than 8.5 megawatts in the
20 summer.

21 However, the smaller the plant, the more challenging it is to develop an economically
22 viable project. In the power industry, economies of scale are very important to economic
23 viability and to the cost of power. Limiting the output of an Idaho PURPA thermal plant

1 to an hourly output not to exceed 10 megawatts would create another significant economic
2 barrier to the development of Idaho's renewable energy resources.

3 Q. WHY DO YOU THINK IDAHO POWER INSISTS THAT THE PUC MEANT FOR THE
4 10 MW PUBLISHED RATES CONTRACTS TO BE LIMITED TO 10 MW IN ANY
5 ONE HOUR?

6 A. Throughout our long contract negotiations, Idaho Power has insisted on defining the Idaho
7 PUC's 10 megawatts order as meaning no more than 10 megawatts in any one hour. It has
8 acknowledged that this is a departure from previous contracts, but has offered the
9 explanation of "simplicity of contract administration." This does not ring true or make
10 sense to me. Daily, monthly or annual average output contracts are just as easily and
11 simply administered.

12 Idaho Power is well aware of the economies of scale of power plant construction. It
13 is also well aware of the realities of the performance of thermal power plants as ambient
14 temperatures change. By limiting the output of PURPA plants to 10 megawatts in any
15 hour Idaho Power positions itself to buy only the absolute minimum amount of power
16 from QF facilities, individually and in the aggregate. I don't believe this is consistent with
17 the Commission's goal of encouraging additional PURPA facilities.

18 **D. SIZING A 10 MW GEOTHERMAL POWER PLANT**

19 Q. PLEASE DESCRIBE THE SIZING OF A GEOTHERMAL POWER PLANT?

20 A. It is important to note that the final detailed design of the RRGPP has not yet been started.
21 There are many factors that are not yet fully defined, such as productivity of the production
22 wells, injectivity of the injection wells, the identity of equipment suppliers, etc., that will
23 have an effect on the exact parasitic loads of the plant and the response of the power plant

1 to changing temperatures. Unfortunately, entering into a detailed design process without a
2 firm contract in hand is costly, risky and therefore not economically possible for U. S.
3 Geothermal. However, the performance of the actual RRGPP, once it is built, will be
4 similar to the generation forecasts made as part of the proposed Idaho Power contract, and
5 included in this testimony.

6 Q. HOW DID YOU COME UP WITH THE MONTHLY FORECAST OF POWER PLANT
7 OUTPUT FOR A 10 MW RAFT RIVER GEOTHERMAL POWER PLANT?

8 A. There were three major steps in estimating the monthly output of the RRGPP.

- 9 • Site-specific weather data was downloaded from the internet and analyzed.
- 10 • Power Engineers, Inc., a worldwide leader in power plant engineering and design,
11 located in Hailey Idaho, was hired to develop a computer model of a binary
12 geothermal power plant at Raft River, and to predict it's output over a range of
13 temperatures.
- 14 • The Malta weather data, and the Power Engineers' forecast were merged to estimate
15 the average monthly output from the power plant. This was then used to fill in the
16 monthly output forecast for the Idaho Power contract.

17 Q. WHAT WAS THE SOURCE OF THE WEATHER DATA FOR THE ANALYSIS, AND
18 HOW WAS IT USED?

19 A. The weather data was downloaded from the USDA Agrimet weather site for the Malta
20 weather station, about 20 miles from the site of the RRGPP. The data is available in
21 several forms, including hourly data and monthly average data.

22 The prediction of the monthly generation for the Idaho Power contract is based on the
23 historical monthly average temperature over a four-year period, from October 1998 to

September 2002. For example, the monthly average temperatures reported on the Agrimet site from January of 1999, 2000, 2001, and 2002, were averaged to arrive at the expected January temperature. The same process was used for all twelve months. The resulting average temperatures are presented in the following table. The annual average temperature based on these twelve values is 47.5°F.

TABLE 1: Monthly Average Temperature
Monthly Average Temperatures (°F) Used for the Idaho Power Contract
Based on a 4-Year Average of the Monthly Average Temperatures
at the Malta USDA Agrimet Station

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
28.0	31.2	38.4	45.6	54.6	63.0	71.4	69.5	58.8	47.2	35.8	26.5

Q. HOW WAS THE ANNUAL AVERAGE TEMPERATURE USED?

A. As discussed above, the rating of a power plant must be for a specific environmental condition and for a specific elevation. The geothermal power plant model developed by Power Engineers used an elevation of 4800 feet and the annual average temperature as the design point. This is consistent with industry practice for air-cooled geothermal power plants. It is also consistent with our expectation that we would have a 10 megawatt PURPA contract, and we therefore attempted to “model” the output of a plant that would likely produce an annual average generation of approximately 10 megawatts.

Q. WHY WOULD A POWER PLANT WITH A 10 MW RATING AT THE ANNUAL AVERAGE TEMPERATURE ONLY “LIKELY” PRODUCE AN ANNUAL AVERAGE GENERATION OF 10 MW?

A. Neither the generation curve, nor the temperature distribution, above and below the design point is absolutely symmetrical. Therefore the plant might not produce exactly 10 megawatts as an annual average. As with many other aspects of the power plant design,

1 this fact highlights the variability in the power plant output on a month-to-month and year-
2 to-year basis. For example, while the monthly average temperature in November used in
3 the forecast was 35.8° F the actual monthly average temperature over that four year period
4 alone ranged from 26.1° F to 40.9° F.

5 Q. PLEASE DESCRIBE THE RAFT RIVER GEOTHERMAL POWER PLANT MODEL
6 CONSTRUCTED BY POWER ENGINEERS?

7 A. Power Engineers created a numerical computer model of the RRGPP for the annual
8 average temperature. The model included the following components:

- 9 • a fixed assumed load for the production and injection pumps handling the
10 geothermal water;
- 11 • boiler feed pumps to pump the butane from the condenser to the boiler;
- 12 • heat exchangers (pre-heaters, boilers, and superheaters) between the geothermal
13 water and the working fluid;
- 14 • piping and heat exchanger pressure losses;
- 15 • turbine; and
- 16 • air-cooled condenser with performance related to ambient temperature.

17 Once the model had been calibrated to produce 10 megawatts at the design condition,
18 the ambient temperature was varied over a range from 0° F to 100° F. An estimate was also
19 made by Power Engineers of the maximum gross and net output, which looked like it
20 would occur somewhere around -20° F. The predicted output was interpolated between
21 0° F and -20° F.

22 Q. WAS THIS POWER FORECAST USED IN THE CALCULATION OF POWER
23 DELIVERIES FOR THE IDAHO POWER CONTRACT?

A. Essentially, but not exactly. Power Engineer's original model was based on a production and injection pump parasitic load of over 4.5 MW, based on U.S. Geothermal's early expectations of the pump load. Later estimates assume a parasitic load of 2.5 MW, more consistent with other geothermal binary power plants. Therefore, U.S. Geothermal recalculated the power plant output as a function of temperature with the 2.5MW load instead of the original 4.5 MW load. However, other than this adjustment, the calculations of the power plant's output as a function of ambient temperature is Power Engineers' work, based on its experience designing similar power plants, and using its RRGPP computer model. A sample of the table, is presented below.

Table 2: Plant Output vs. Drybulb Temperature
Sample of Predicted Output as a Function of the Drybulb Temperature
for a 10 MW Geothermal Power Plant at Raft River

Sample Drybulb Temperature	Gross	Plant net	Production & Inject. Pumps	NET to IPCo
°F	MW	MW	MW	MW
-20	17.45	15.19	2.5	12.69
-18	17.45	15.16	2.5	12.66
-16	17.45	15.12	2.5	12.62
10	17.37	14.64	2.5	12.14
12	17.33	14.58	2.5	12.08
14	17.28	14.52	2.5	12.02
46	15.62	12.67	2.5	10.17
Design 48°F	15.46	12.50	2.5	10.00
50	15.29	12.33	2.5	9.83
80	11.89	8.98	2.5	6.48
82	11.61	8.71	2.5	6.21
84	11.32	8.43	2.5	5.93

Sample Drybulb Temperature	Gross	Plant net	Production & Inject. Pumps	NET to IPCo
96	9.43	6.64	2.5	4.14
98	9.09	6.32	2.5	3.82
100	8.75	5.99	2.5	3.49

Q. HOW WERE THE TWO SETS OF DATA (MONTHLY AVERAGE TEMPERATURE AND OUTPUT OF THE RRGPP AS A FUNCTION OF TEMPERATURE) USED IN THE IDAHO POWER CONTRACT?

A. The two sets of data were combined and used in three ways in the contract.

- *Maximum Monthly Energy*: This value was calculated by using the average monthly temperature to find the expected average power plant output at that temperature. The number of hours in the month was multiplied by the output of the plant at that temperature.
- *Expected Monthly Energy*: The Maximum monthly energy is multiplied by the long-term expected annual capacity factor of 95%.
- The *Maximum Plant Output* is simply the expected output of the plant in the middle of winter. As the table above shows, that is approximately 12.7 MW.

Q. IS IT REASONABLE TO EXPECT IDAHO POWER TO ACCEPT 12.7 MW OF POWER FROM A 10 MW FACILITY?

A. It is reasonable, because that is what a 10 megawatt air-cooled geothermal power plant can produce in the coldest hours of an Idaho winter. Just as Idaho Power is willing to accept the full output of the RRGPP when the design temperature is above 48°F, it is reasonable to expect it to accept the full output of the power plant when the design temperature is below 48°F, even though that happens to produce more than 10 megawatts. Capping the output of

1 a 10 megawatt geothermal power plant at 10 megawatts in any hour would result in an
2 artificial contractual curtailment of the plant in every single month of the year (including
3 July and August). This is clearly constraining the development of geothermal power in a
4 manner I consider to be unreasonable.

5 What is the benefit to the developer in such a contractual arrangement? There is
6 none. In fact, it results in substantial lost revenue. What is the benefit to the ratepayers of
7 Idaho Power? There is none. What is the benefit to Idaho Power? There is none, unless it
8 has an explicit goal of limiting the amount of PURPA contract power it must purchase.

9 Q. SINCE THE POWER PLANT MODEL AND THE WEATHER DATA ARE
10 AVAILABLE, CAN THE RRGPP BE GUARANTEED TO MEET THE MONTHLY
11 EXPECTED OUTPUT FROM THE PLANT?

12 A. Not really. Consider the point discussed above, that in a four-year period, there was a
13 range of average November temperatures from 26 to 41° F, with an average of 36° F. Now
14 suppose that there is a November with an average temperature of 43° F, then the power
15 plant will produce about 10.3 MW average, instead of the 10.9 MW average for 36° F.

16 Idaho Power is insisting on a 90/110 band on the *monthly* output from the plant. If
17 the output is below 90%, then the developer is subject to penalties. For this hypothetical
18 month, the weather alone will have eaten up 5.5% ($0.6/10.9 = 5.5\%$) of the total allowable
19 10% decrease from the forecasted output. This example shows one of many reasons why
20 Idaho Power's insistence on the 90/110 band is not reasonable. Idaho Power requires its
21 generation forecasts to be set up as much as two years in advance. How would it be
22 possible to predict there is going to be a warm November, and the output of the power plant
23 will not be able to generate its predicted load even if there are no mechanical problems

1 whatsoever? It is not. The 90/110 band is not reasonable for many reasons, including that
2 it makes no allowance for weather circumstances beyond the control of the operator.

3 Q. WHAT ARE SOME OF THE OTHER ARGUMENTS AGAINST THE 90/110
4 MONTHLY BAND?

5 A. There are many sound arguments. Some of these are briefly described below.

6 1. The selection of a band of 90/110 appears arbitrary, and solely at the whim of Idaho
7 Power. Why not 75/125 or 70/130? Can Idaho Power provide a technical basis for
8 justifying a 90/110 band, especially on such small power plants? Its implicit argument
9 would seem to be that the failure of one plant to deliver as little as 1 MW over the course
10 of a month is somehow financially taxing to it and to the ratepayers. This is not a credible
11 argument. The hourly and monthly uncertainty in Idaho Power's served load is most
12 likely far greater than the entire output of the RRGPP, let alone the failure of a PURPA
13 plant to deliver a mere one to two megawatts.

14 2. The band makes no allowance for the normal breakdown of equipment in a power
15 plant. Such breakdowns would be intrinsically part of the Idaho Surrogate Avoided
16 Resource (SAR) were it a real plant. Yet in the cost calculation of the SAR, there is no
17 inclusion of penalties for those times when the SAR cannot deliver its presumed capacity.
18 In fact, it is just the opposite of the PURPA plant. The SAR would stay in the rate base
19 and continue to be paid off, even if it were unable to deliver power for several months.
20 The consumer would effectively double-pay for these failures, paying for both the asset
21 and for the replacement power. By contrast, under all of Idaho's existing PURPA
22 contracts, the ratepayer still pays for the replacement power, just like the SAR, but unlike
23 the SAR they *pay nothing for the PURPA asset that is failing to deliver power.*

1 3. Idaho Power has selected a "seasonal" approach to power pricing, yet the penalties
2 are monthly. If firmness is desired, it would be far more reasonable to use a "seasonal"
3 firming, rather than monthly firming, as over the course of the year this would much better
4 reflect the actual costs to the ratepayers of Idaho Power.

5 4. The only reason allowed, contractually, for failure to deliver would be "Force
6 Majeure." So the routine failure of one of the downhole production pumps, warmer than
7 normal weather, or a shutdown for scheduled maintenance one week early would all result
8 in the imposition of penalties.

9 5. There is no opportunity to "make-up" for power that is not delivered, as is common in
10 other firming contracts. This is especially onerous if Idaho Power is successful in its
11 contention that the power plant can never deliver more than 10 megawatts in any one hour.

12 6. It is again worth noting that the PURPA plant is required to forecast its monthly
13 generation up to two years in advance, and if it fails to deliver its estimated power, then it
14 is penalized. If a firming contract is required, it would be much more reasonable for Idaho
15 Power to require the plant to forecast its output one to two months ahead, which would
16 then allow Idaho Power to use more up-to-date information in purchasing or selling power
17 to match its system requirements.

18 7. Lastly, In the May 21, 2004 letter from Mr. Barton Kline of Idaho Power to the
19 counsel of U.S. Geothermal, Idaho Power has offered to cap the total liability of the U.S.
20 Geothermal under the 90/110 provision. But even with this concession in an extreme
21 power price scenario such as the one the Western United States experienced a few years
22 ago, a failure to deliver contract amounts for only a month or two could wipe out an entire
23 year of profits or even lead to bankruptcy. One has to wonder what would have happened

1 to Idaho Power itself if it had been subject to the same proviso when the combination of
2 extreme drought and skyrocketing prices hit the Northwest. The ratepayer is not served by
3 such draconian consequences, and from a business perspective it is hard to imagine that
4 lenders would be eager to participate in contracts with such dire risks.

5 **E. CONTRACT TERMS RELATED TO THE 10 MW SIZE**

6 Q. SOME OF THE RECENT PURPA CONTRACTS APPROVED BY THE COMMISSION
7 USE THE POSTED RATE FOR DELIVERIES UP TO TEN MEGAWATTS, AND A
8 DIFFERENT RATE FOR DELIVERIES IN EXCESS OF TEN MEGAWATTS. IS U.S.
9 GEOTHERMAL ASKING FOR THIS TYPE OF CONTRACT?

10 A. No. We are only seeking posted rates for the sale of ten average megawatts of power. We
11 are not asking Idaho Power to purchase "excess energy" above the ten average megawatts.

12 Q. HAVE YOU MADE THIS POSITION CLEAR TO IDAHO POWER?

13 A. Yes. From the very beginning of our submittal of a first contract revision and discussions
14 in October 2003, I believe Idaho Power has understood our position. While we disagree
15 on the definition of the 10 megawatt cap, all of our negotiations have been premised on the
16 mutual understanding that we were negotiating a power sales agreement priced at the non-
17 levelized posted rates, and that the plant would be capable of more than 10 megawatts at
18 peak, but approximately 9.5 megawatts on average. In an additional concession to Idaho
19 Power, we have agreed to cap the annual output at 10 megawatts.

20 Q. HAS IDAHO POWER RECENTLY CHANGED ITS POSITION ON THE RAFT RIVER
21 FACILITY'S ENTITLEMENT TO POSTED RATES?

22 A. Yes. On May 21, 2004, Mr. Barton Kline sent a letter to U.S. Geothermal's counsel that,
23 for the first time, stated that Idaho Power does not believe that U.S. Geothermal is entitled

1 to posted rates because the facility will have a *nameplate* capacity in excess of 10
2 megawatts and will deliver more than 10 MW to Idaho Power during some hours. This
3 objection had never been raised in our prior 15 months of negotiations and discussions.

4 Q. WHAT WOULD BE THE PRACTICAL EFFECT ON U. S. GEOTHERMAL IF IDAHO
5 POWER IS ALLOWED TO NOW CHANGE POSITION ON THIS CRITICAL ISSUE?

6 A. It would be both unfair, and potentially devastating. Our disagreement with Idaho Power
7 has always been over the amount of power it is required to purchase at the posted rates.
8 All of the draft contracts exchanged between the parties incorporate the posted rates in the
9 purchase price, and Idaho Power has never suggested that those rates would not apply. In
10 good faith reliance on Idaho Power's original position, we have spent considerable time,
11 energy, and money in negotiations with Idaho Power and all the other efforts necessary to
12 bring this project to fruition. In addition, we have supplied the draft contracts and their
13 posted rates to existing U. S. Geothermal investors, as well as potential investors and
14 lenders.

15 Now Idaho Power is suddenly taking the position that it will only buy from U.S.
16 Geothermal at some unknown modeled rate to be developed at some time in the indefinite
17 future. If Idaho Power is allowed to arbitrarily reverse direction in this manner, it could
18 potentially destroy our business plan and waste the nearly \$1.5 million we have expended or
19 committed over the last 10-12 months. Moreover, it will damage our credibility with
20 potential lenders and investors, making the implementation of the project much more
21 difficult.

1 **F. RECOMMENDATIONS FOR PUC ACTION**

2 Q. IN SUMMARY, WHAT ISSUES ARE YOU REQUESTING TO BE INCLUDED IN THE
3 COMMISSION RULINGS?

4 A. I have discussed three issues:

- 5 1. The engineering definition of a “10 megawatt” geothermal power plant;
6 2. Whether a geothermal plant with capacity that sometimes exceeds 10 megawatts
7 should nevertheless be eligible for published PURPA rates.
8 3. Whether the 90/110 performance penalty is fair and reasonable.

9 Q. WHAT ACTION ARE YOU ASKING THE COMMISSION TO TAKE IN DEFINING
10 THE 10 MW POWER PLANT THAT WOULD QUALIFY FOR THE IDAHO PURPA
11 PUBLISHED RATES?

12 A. U.S. Geothermal is asking the Idaho PUC to rule that a 10 megawatt geothermal power
13 plant is defined by the ability to deliver no more than 10 megawatts as an annual average.
14 This should be interpreted to mean that at the average design condition the power plant
15 will deliver no more than 10 megawatts, and at temperatures above the design point, the
16 generation will be lower. At temperatures below the design point, the output will be
17 higher. This is the traditional way of defining the output of a thermal plant and is totally
18 consistent with industry practice.

19 The use of 10 megawatts as the maximum hourly output to qualify for published
20 PURPA rates would result in the size of the RRGPP being reduced to only a power plant
21 rating of approximately 8 megawatts. This 20% reduction in the design rating would be
22 disastrous for the economic viability of our project. It is entirely possible that an 8 MW
23 project would not be economically feasible, and would have to be abandoned.

1 Q. WHAT ARE THE REASONS FOR THE COMMISSION TO DISALLOW IDAHO
2 POWER'S DEMAND FOR A 90/110 BAND TO FIRM THE DELIVERY OF POWER
3 UNDER PURPA CONTRACTS.

4 A. The reasons described earlier in the testimony are briefly summarized below:

5 1. Idaho Power has not produced any supporting calculations that this band has not been
6 fished out of thin air. Nor has it shown how the failure to deliver as little as 1.1 MW over
7 the course of a month disrupts its load planning.

8 2. The cost (and value) of firming the delivery of power from the SAR is not included in
9 the calculated PURPA price. Idaho Power should not therefore be allowed to gain that
10 value for free in PURPA contracts.

11 3. Idaho Power's proposed PURPA contract is treated substantially and
12 disadvantageously differently than Idaho Power's own rate based plants, which are not in
13 any way subject to firm delivery penalties, and in fact are paid for, even when they fail to
14 deliver power.

15 4. There is no opportunity for make-up of shortfalls on either a monthly, or more
16 reasonably, a seasonal basis.

17 5. Forecasts must be made up to two years in advance and cannot be changed at any
18 time, nor is any allowance made for circumstances beyond the control of the operator, such
19 as warmer than normal weather, nor for occasional and inevitable normal short-term
20 breakdowns of equipment.

21 6. A final reason would appear to be the recommendations of the PUC Staff itself. The
22 Comments of the Commission Staff dated April 4, 2003, regarding the Tiber Contract
23 (IPC-E-03-1) states: "Staff recommends . . . that those non-standard terms unique to the

1 contract (i.e., measurement of the 10 MW rating, encouraging increased firmness, and
2 seasonality) not be viewed as precedential.”

3 Q. WHAT RULING ARE YOU ASKING THE COMMISSION TO MAKE ON THE
4 ELIGIBILITY OF THE PLANT FOR THE PUBLISHED PURPA RATES?

5 A. We are only asking that the Commission to decide this issue in accordance with the law,
6 applicable Commission orders, and common sense. We are seeking posted, non-levelized
7 rates for the delivery of ten megawatts of power to Idaho Power. We have interpreted the
8 10 megawatt limit on eligibility for posted rates to mean 10 average megawatts,
9 determined on an annual basis. From our point of view, this definition is fair, and based
10 on the actual physical performance of a 10 megawatts power plant.

11 However, if the Commission adopts another interpretation we will comply with it in
12 order to qualify for the posted rates. But under no circumstances should Idaho Power be
13 allowed to repudiate the entitlement to posted rates it has previously acknowledged, as
14 suggested in its letter of May 21, 2004.

15 Q. DOES THIS CONCLUDE YOUR TESTIMONY?

16 A. Yes, it does.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 9th day of June 2004, I caused to be served a true and correct copy of the foregoing document by the method indicated below and addressed to the following:

Jean Jewell
Idaho Public Utilities Secretary
472 W. Washington Street
P.O. Box 83720
Boise, ID 83720-0074

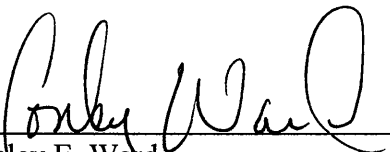
☐ U.S. Mail
☒ Hand Delivered
☐ Overnight Mail
☐ Facsimile

Barton L. Kline
Idaho Power Company
1221 W. Idaho Street
P.O. Box 70
Boise, ID 83707

☐ U.S. Mail
☒ Hand Delivered
☐ Overnight Mail
☐ Facsimile

Peter J. Richardson
Richardson & O'Leary
99 E. State Street, Ste. 200
P.O. Box 1849
Eagle, ID 83616

☒ U.S. Mail
☐ Hand Delivered
☐ Overnight Mail
☐ Facsimile



Conley E. Ward

KEVIN KITZ, P.E.
VICE PRESIDENT PROJECT DEVELOPMENT
U.S. GEOTHERMAL INC.

Currently, Mr. Kitz is the Vice President – Project Development, for U.S. Geothermal, Inc. He is responsible for the design and evaluation of a geothermal power and direct use project. His responsibilities include procuring power sales agreement. Evaluate power technologies. Develop and implement drilling plans.

PREVIOUS EXPERIENCE

Power Plant Engineering Advisor, Unocal - Philippines
Project initiation and engineering support for operating, maintenance, and rehabilitation projects for 12 x 55 MW power plants and two geothermal fields. Managing 2-10 engineers and consultants. Project size to \$25MM. 1995-2002

Production and Senior Production Engineer, Unocal - The Geysers
Project engineer for Geysers, Philippine, and Indonesia work. Geysers operations engineer. Project-manager for major capital and optimization projects in Philippines. 1991-1995

Production and Operations Engineer, Unocal - Salton Sea
Project engineer on design, construction and start-up three geothermal power plants (75 MW). Operations engineer for crystallizer and acidification processes and power plants supplying 5 turbine designs. 1985-1991

PUBLICATIONS/PATENTS

1. *Geothermal Steam Processing*: US Patent numbers 6,223,535B1, 6,286,314, 6,332,320. Other US patents and foreign patents pending, comprising over 100 pages with more than 200 claims. Possible breakthrough waste minimization and circulating water chemistry control technology. (Sole inventor)
2. *Treatment of Geothermal Brine with Sulfur-Containing Acid*. US Patent 08, 581,650. Concept: Conversion of H_2S in NCGs to Sulfurous Acid (H_2SO_3) to reduce silica scaling rates. (Joint invention)
3. *Method to Treat Geothermal Fluid Streams*. US Patent No. 5,364,439. (Joint invention)
4. *Method for Protecting Stainless Steel Pipe and the Like in Geothermal Brine Service from Stress Corrosion Cracking, and articles made thereby*. US Patent No. 4,950,552. Concept: Spray metal protection. (Joint invention)
5. Kitz, Kevin P.E. (2002) *Low-Cost Separation of Contaminant-Rich Turbine and Condenser Condensate For Operating and Capital Cost Savings*. Geothermal Resource Council Annual Meeting [GRC].

EDUCATION

University of California,
Davis
BS - Mechanical
Engineering, and Material
Science(with honors)
Engineering Honors Society,
Tau Beta Pi
Humanities Honors Society,
Phi Beta Kappa

1995-2002

YEARS IN PROFESSION

18 Years

REGISTRATIONS

Registered Professional Engineer:
California 1991-1995

AREAS OF EXPERTISE

Geothermal Power Plant;
1985-1991

- evaluation
- design
- maintenance
- rehabilitation
- operations

Construction/Project
Management
Bidding/Contractor Selection
Regulatory Negotiations
Regulatory Compliance

Synergistic Activities

Idaho Geothermal Energy
Working Group (IGEWG). Mr.
Kitz services on the Geothermal
Electric Power Development
Subcommittee.

Exhibit No. 2

Case Nos. IPC-E-04-08 and IPC-E-04-10

K. Kitz, U.S. Geothermal

June 9, 2004